

STUDY TIPS FOR YOUR ENGINEERING AND SCIENCE COURSES

LECTURE

Go! It is better to learn the information firsthand. Be an active learner!

Note-taking - When taking notes in class, listen actively; intend to learn from the lecture.

1. Write down the instructor's explanatory remarks about the problem.
 - Note how one gets from one step of the problem to another.
 - Note any particular conditions of the problem.
 - Note why the approach to the problem is taken.
2. Try to anticipate the consequences of a theorem or the next step in a problem. During a proof, keep the conclusion in mind.
3. Note any concepts, rules, techniques, problems that the instructor emphasizes.
4. Question your instructor during class about any unclear concept or procedure. Try to answer questions too!
 - **TIP:** If you are too shy to ask questions, write them down and ask after class or in office hours.
5. If you miss something in the lecture or don't understand what's being presented, then write down what you can catch-especially key words. Be sure to skip several lines so you can fill in the missing material later.
 - **TIP:** Use faculty office hours to help clarify or fill in the missing blanks.
6. As soon as possible after class, summarize, review, and edit your notes.
 - Quickly read through your notes to get an overview of the material and to check for any errors or omissions.
 - Fill in any information-especially explanatory remarks (see #1 above)-that you did not have time to write down or that the instructor did not provide.
 - Use the margin or the back of the opposite page to summarize the material, list key terms or formulas, and rework examples. You can also use this space to take notes from the textbook.
 - Note any relationship to previous material; i.e., write down key similarities and differences between concepts in the new material and concepts in previously learned material.
7. Review your notes at regular intervals and review them with the intent to learn and retain.

DISCUSSION SECTION

Discussion sections have fewer people so you can gain a more in-depth understanding of the material presented in lecture. ATTEND!

- Learn the format of your discussion and prepare accordingly.
 - If weekly problem sets are discussed, do your problem set to the best of your ability before section. Try to meet with your study group also. Then you will be more prepared to ask the questions you really need answered.
 - If further explanation of course material is discussed, review lecture notes and text before section. Prepare questions for class.

OFFICE HOURS

Go to faculty and TA office hours! Mark it on your schedule as a weekly obligation, like class and discussion.

NOTE: TA office hours are NOT a substitute for faculty office hours.

1. Ask questions about assignments (problem sets, programs, labs)
2. Ask for help in understanding lecture notes

3. Ask about preparing for exams. How do I approach studying for the exam? What material do I need to emphasize when I study?
4. Get the big picture. How does this course information fit into the larger picture of engineering and computer science?
 - **TIP:** If work, class or another important event happens each week during the professor's scheduled office hours, let your professor know AND set a standing weekly appointment with him or her.

TEXTBOOK

- **TIP:** Ask students who have previously taken the course, how useful the textbook was. Then act accordingly!

Previewing - Before class briefly preview the text material that will be covered in the lecture.

1. Get an overview of the material by reading the introductory and summary passages, section headings and subheadings, and diagrams.
2. Look at the problems at the end of the chapter.
3. Make note of new terms and theorems.
4. Review (if necessary) old terms and definitions referred to in the new material.
5. Formulate possible questions for class.

Remember, the purpose of previewing is not to understand the material but to get a general idea of what the lecture will cover. This should not be a very time-consuming process.

Text Reading

- **TIP:** If pressed for time, focus on your problem sets and programs, instead of the text readings.

If your class lectures provide a good overall structure of the course, you can use your text to clarify and supplement your lecture notes. In order to create a single study source, insert the notes you take from the text into your lecture notes themselves as well as in the margin or the back of the opposite page.

If your text provides the best overall structure of the material, then you can use your lecture notes as the supplementary source. In either case consider the following procedures:

1. Briefly preview the material. Get an overview of the content and look at the questions at the end of the chapter.
2. Read actively and read to understand thoroughly.
 - Formulate questions before you read (from lecture notes or from previewing) and read to answer those questions.
 - Know what every word and symbol means.
 - Translate abstract formulas to verbal explanations.
 - Analyze the example problems by asking yourself these questions:
 - What concepts, formulas, and rules were applied?
 - What methods were used to solve the problem? Why was this method used?
 - What was the first step?
 - Have any steps been combined?
 - What differences or similarities are there between the examples and homework problems?
 - Further analyze the example problems by using the following procedures:

- Explain each step using your own words. Write these explanations on paper.
- Draw your own diagrams to illustrate and explain problems.
- For practice, write down example problems from your book, close your book, and try to work the problems. Check your work with the example to find what concepts, rules, or methods you are having trouble with.
- Check to see how the material relates to previous material. Ask yourself these questions:
 - How was the material different from previous material?
 - How was it the same?
 - What totally new concepts were introduced and how were they applied?
 - Where does this material "fit" within the overall structure of the course?

3. Stop periodically and recall the material that you have read.

Review prerequisite material, if necessary.

- **TIP:** Work on problem sets or programs before or during office hours. You can receive "real-time" help when working on assignments.

PROBLEM SETS

- **TIP:** Work in groups! For each class, try to study with the same group of people at the same time.

Problem Solving - Solving problems is usually the most important aspect of engineering courses. You must, therefore, spend much of your study time either working or studying problems. When working a problem, follow these steps:

1. Read through the problem at a moderate speed to get an overview of the problem.
2. Read through the problem again for the purpose of finding out what the problem is asking for (your unknown). Be able to state this in your own words.
3. If appropriate, draw a diagram and label the givens.
4. Read each phrase of the problem and write down (symbolically or otherwise) all information that is given.
5. Devise a tentative plan to solve the problem by using one or more of the following tactics:
 - Form relationships among all facts given. (Write an equation that includes your unknown.)
 - Think of every formula or definition that might be relevant to the problem.
 - Work backwards; ask yourself, "What do I need to know in order to get the answer?"
 - Relate the problem to a similar example from your textbook or notes.
 - Solve a simpler case of the problem using extremely large or small numbers; then follow your example as if it is an example from the text.
 - Break the problem into simpler problems. Work part of the problem and see if it relates to the whole
 - Guess an answer and then try to check it to see if it's correct. The method you use to check your answer may suggest a possible plan.

If you are making no progress, take a break and return to the problem later.
6. Once you have a plan, carry it out. If it doesn't work, try another plan.
7. Check your solution.
 - Check to see if the answer is in the proper form.
 - Insert your answer back into the problem. Make sure your answer is "reasonable"

During the problem solving process, it is often helpful to say out loud all of the things you are thinking. This verbalization process can help lead you to a solution.

- **TIP:** Be prepared and maximize your efforts. Before meeting with your study group, attending discussion sections, or faculty and TA office hours, make sure you have tried to work the problems.

Problem Analysis - After you have worked a problem, analyze it. This can help sharpen your understanding of the problem as well as aid you when working future problems.

1. Focus on the processes used (not the answer) and ask yourself these questions:
 - What concept, formulas, and rules did I apply?
 - What methods did I use?
 - How did I begin?
 - How does the solution compare with worked examples from the textbook or my notes?
 - Can I do this problem another way? Can I simplify what I did?
2. Explain each step using your own words. Write these explanations on your paper.

- **TIP:** Perform the problem analysis with your study group. Take turns explaining problems to each other. You will reinforce what you have learned by explaining it each other

PROGRAMMING ASSIGNMENTS

- **TIP:** Programming assignments increase in difficulty as the semester progresses. You will need to recalculate your expected time for completion for each program.

1. Read through the programming assignment several times, making sure you understand the problem statement. Ask TA's, faculty, and peers for clarification.
2. Make sure you have a solid understanding of the concepts and tools needed to complete the programming assignment. Review the concepts and tools, if necessary. Use office hours!
3. Plan, Plan, Plan - Design your program first. Spend a significant amount of time on this. If possible, run it by TA to make sure you are headed in the right direction. NOTE: This is a good time to also plan your time schedule for the assignment.
4. Program in sections. Test each section before moving on to the next. This will prevent a lot of headaches in the end. Start with your most difficult section first or create the framework for your program, whichever makes sense for your program.
5. Debug! This always takes more time than you think. Allow twice as much time as you think. Plan ahead. DO NOT save debugging for the night before!
6. Comment and turn in!

- **TIP:** Set at least one (1) block of "unlimited" time aside each week to work on your programming assignments. This helps you feel less pressured for time when you encounter unexpected problems in your assignment.

EXAMS

Test Preparation - START EARLY!!

- **TIP:** Find old exams! Work old exams! Old exams from your current professor are best, but any old exam for the course helps. By working old exams, you gain an understanding of what material the professor feels is important and the types of questions that will be asked.

If you have followed an approach to study as suggested in this handout, your preparation for exams should not be overly difficult. Consider these procedures:

1. Quickly review your notes to determine what topics/problems have been emphasized.
2. Look over your notes and text. Make a concept list in which you list major concepts and formulas, which will be covered